Chapter 29

Infectious Diseases

Ocular Infections

Neonatal Conjunctivitis

- Symptoms: significant findings may be either profuse purulence or hemorrhage in the conjunctiva
- Etiology: *Neisseria gonorrhoeae, Chlamydia trachomatis*, herpes simplex virus (HSV)
- Diagnosis
  - Gonococcal: perform deoxyribonucleic acid (DNA) probe if available, Gram stain, and culture on Thayer-Martin or chocolate agar
  - Chlamydia: perform a Giemsa stain for intracytoplasmic inclusions (low sensitivity)
  - HSV: take a viral culture; in neonates, rule out disseminated HSV by checking cerebrospinal fluid and liver transaminases
- Treatment
  - Gonococcus
    - Administer ceftriaxone (50 mg/kg intramuscular [IM] or intravenous [IV] × 1 dose) or cefotaxime bid for 7 days if neonate is hyperbilirubinemic
    - Irrigate every 2–3 hours with saline
    - Topical antibiotics are not recommended
  - Chlamydia
    - Administer oral (PO) erythromycin (50 mg/kg/day in 4 divided doses) for 14 days, or azithromycin 20 mg/kg as single dose or over 3 days
  - HSV
    - Apply topical trifluridine or vidarabine for 7–10 days
    - Consult an ophthalmologist if possible
    - In severe cases or if infection has disseminated, administer IV acyclovir 20 mg/kg/dose tid for 14–21 days
- **Neonatal prophylaxis**: apply topical 1% silver nitrate, 1% tetracycline, or 0.5% erythromycin ointment

Trachoma

- Symptoms
  - Chronic, mucopurulent drainage
  - Follicular inflammation on the upper eyelid
  - Trichiasis (scarring with lashes turned inward)
- Etiology
  - *C trachomatis* serovars A–C
  - Endemic in developing parts of world
  - Major cause of blindness worldwide
- Diagnosis: clinical
- Treatment
  - PO azithromycin (20 mg/kg × 1; 1 g maximum dose)

    OR
  - Erythromycin or tetracycline ophthalmic drops bid for 2 months

Periorbital Cellulitis

- Symptoms: erythema and edema surrounding eye
- Etiology
  - Inoculation from trauma or insect bite (*Staphylococcus aureus* or group A streptococcus) or bacteremic seeding (*Haemophilus influenzae* type B [Hib] or *Streptococcus pneumoniae*)
- Diagnosis
  - Clinically assess for normal globe movement, lack of proptosis, and lack of pain with extraocular muscle use
  - Obtain blood cultures
- Treatment
  - Administer third-generation cephalosporin
  - Add an antistaphylococcal drug if trauma is suspected or skin is broken
  - Perform lumbar puncture if Hib is suspected or if there is evidence of meningitis

Orbital Cellulitis

- Symptoms
  - Periorbital edema and erythema
  - Proptosis, severe eye pain, vision loss; limitation of extraocular movement in more severe cases
- Etiology

  - Underlying bacterial sinusitis
  - *S pneumoniae*
  - *Streptococcus pyogenes*
  - *S aureus*
  - *H influenzae* (nontypable)
  - *Moraxella catarrhalis*
  - Anaerobes in older children
- Diagnosis
  - Clinical
  - Computed tomography (CT) scan, if available, to assess for abscess
- Treatment
  - IV ceftriaxone and clindamycin; or ampicillin (AMP)/sulbactam as alternative
  - Consider surgical intervention if condition continues to progress 24–48 hours after treatment, or if there is evidence of subperiosteal abscess

Disease of the Face and Neck

Buccal Cellulitis
- Symptoms
  - Acute cheek edema and erythema anterior to parotid, associated with fever
- Etiology
  - *H influenzae*
  - Oral flora will be present if the condition is an extension of odontogenic infection
- Diagnosis
  - Clinical
  - Blood culture
- Treatment: IV third-generation cephalosporin or AMP/sulbactam

Epiglottitis (see Chapter 24, Respiratory Emergencies)

Bacterial Tracheitis (see Chapter 24, Respiratory Emergencies)

Parotitis, Sialadenitis, and Mumps
- Symptoms
  - Painful swelling of the salivary glands (parotid, sublingual,

or submandibular)
  - Fever and toxicity with bacterial infection
- Etiology
  - Viral (usually mumps, human immunodeficiency virus [HIV], or enteroviruses)
  - Bacterial (*S aureus*, gram-negative bacilli, *S pyogenes, S pneumoniae*)
- Diagnosis
  - Clinical
  - Bacterial infection manifests with purulent drainage from Stensen's duct
  - Perform Gram stain and culture
- Treatment
  - Bacterial: hydration and parenteral antibiotics (eg, ceftriaxone, AMP/sulbactam, or other broad-spectrum varieties); cannulate duct or perform surgical drainage in severe or refractory cases
  - Viral: supportive

Parapharyngeal Abscess

- Symptoms
  - Preceding adenitis, tonsillitis, or dental infection, in children ≥ 5 years old
  - Trismus
  - Parotid-area swelling extending below mandible
- Etiology
  - *S pneumoniae*
  - *S aureus*
  - Group A β-hemolytic streptococci
  - Anaerobes
- Diagnosis
  - Retropharyngeal abscess may have bulging posterior pharyngeal wall on plain film
  - Prevertebral soft tissue swelling of greater than 7 mm at the level of the second cervical vertebra, or greater than 14 mm at the level of the sixth cervical vertebra, is suggestive
  - Reversal of the normal cervical curvature may be present. Imaging with CT or magnetic resonance is required for definitive diagnosis
- Treatment: surgical drainage and appropriate IV antibiotic therapy

for primary infection (usually ceftriaxone and clindamycin)

Skin, Soft Tissue, Bone, and Joint Infections
In areas with a high prevalence of community-acquired methicillin-resistant *S aureus*, consider using clindamycin, trimethoprim-sulfamethoxazole (TMP/SMX), or vancomycin (IV only) when initiating empiric therapy for staphylococcal infections.

Cellulitis and Lymphangitis
- Symptoms
  - Erythema
  - Induration
  - Warmth
  - Tenderness
  - Lymphangitic spread (streaks)
- Etiology: most commonly *S aureus*, group A streptococcus, and *H influenzae* in unimmunized toddlers
- Diagnosis
  - Clinical
  - Positive blood culture in < 10%
  - Positive aspirate culture in 50%
- Treatment
  - Oral or IV antibiotics for *S aureus* and group A streptococcus (first-generation cephalosporin, antistaphylococcal penicillin, clindamycin)
  - Rapid progression may indicate infection in deeper tissue planes, such as necrotizing fasciitis

Cutaneous Candidiasis/Yeast Infections
- Symptoms: painful or itchy erythematous rash, usually concentrated in skin folds or covered areas (eg, diaper rash)
- Etiology: *Candida* species (usually *Candida albicans*)
- Diagnosis
  - Clinical appearance
  - Erythema with sharp borders and smaller satellite lesions are frequently seen around the rash border
- Treatment
  - One dose of fluconazole (6–12 mg/kg; maximum dose of 400 mg),

OR

  - Topical antifungals, such as nystatin, terbinafine, econazole,

miconazole, etc

Lymphadenitis

- Symptoms: swollen lymph nodes often associated with erythema, warmth, and tenderness
- Etiology
  - *S aureus*, group A streptococcus, mycobacterial species, toxoplasmosis, and many viruses
  - Consider plague in endemic areas
- Diagnosis
  - Clinical appearance
  - Depending on location, consider throat culture, complete blood count, monospot, and Gram stain and culture of drainage
- Treatment
  - Empiric antibiotics against *aureus* and group A streptococcus
  - Surgical drainage of abscess if needed
  - If not improving, consider tuberculosis (TB), chronic viral infection (eg, HIV), and atypical mycobacteria

Septic Arthritis

- Symptoms: pain, swelling, erythema, warmth, and tenderness of the joint
- Etiology
  - Most common is *S aureus*
  - *N gonorrhoeae* if patient is sexually active
  - Others include group A streptococcus, *S pneumoniae*, *Brucella* (especially hip or sacrum), *H influenzae*, and other gram negatives
- Diagnosis
  - Elevated white blood cell (WBC) count
  - Erythrocyte sedimentation rate (ESR)
  - C-reactive protein (CRP)
  - Ultrasound may reveal fluid in joints
  - Perform Gram stain and culture of joint aspirate
- Treatment
  - Joint drainage is mandatory for hip joints; it may be indicated for other joints
  - Empiric IV antibiotics should cover *S aureus* (first- or second-generation cephalosporin, antistaphylococcal peni-

cillin; alternatively, use vancomycin and clindamycin) and Hib in unimmunized population (AMP, second- or third-generation cephalosporin)
    - Administer ceftriaxone for *N gonorrhoeae*
    - Differential diagnosis in children includes toxic synovitis (reaction to viral infection, especially in the hips), reactive arthritis, and juvenile rheumatoid arthritis

Osteomyelitis

- Symptoms
    - Pain
    - Tenderness over bone (with or without swelling)
    - Overlying erythema
    - Warmth
    - Fever
- Etiology
    - Most commonly *S aureus*
    - Others include group A streptococcus, *H influenzae*, *Kingella*, *Brucella*, and mycobacteria species (including TB)
- Diagnosis: patient will have elevated WBC count, ESR, and CRP; take radiographs of the suspected bones
- Treatment
    - Use empiric IV antibiotics against *S aureus* (first-generation cephalosporin, antistaphylococcal penicillin; alternatively, use vancomycin, or clindamycin)
    - If patient initially presents with a high fever or appears very ill, or for patients with sickle cell disease, cover for gram negatives with ceftriaxone (or similar)
    - Complete 3–6 weeks of antibiotics (switch to PO after 1 week or when CRP is normal)
    - Surgical debridement may be necessary if condition is severe or patient fails to respond
    - Chronic osteomyelitis requires long-term therapy (months to years)
    - If the patient fails to respond to antistaphylococcal medication, broaden coverage to include gram negatives

Pulmonary Infections

Croup (laryngotracheitis/laryngotracheobronchitis; see Chapter

24, Respiratory Emergencies)

Bronchiolitis (see Chapter 24, Respiratory Emergencies)

Pneumonia

- Symptoms: fever, tachypnea, retractions, and focal lung findings
- Etiology
  - **Bacterial:** *S pneumoniae, H influenzae, S aureus, Mycoplasma pneumoniae, Chlamydia pneumoniae, Bordetella pertussis, Mycobacterium tuberculosis, Chlamydia trachomatis* (infants), group B streptococcus (infants)
  - **Viral:** respiratory syncytial virus, influenza, parainfluenza, adenovirus, measles
  - **Parasitic/fungal:** *Pneumocystis carinii/jiroveci* (if the patient has HIV or is immunosuppressed or malnourished)
- Epidemiology
  - All ages, all seasons, high morbidity and mortality in children < 5 years old
  - Risk factors include poverty, crowding, environmental exposures, prematurity, malnutrition, immunosuppression, lack of breast-feeding
- Diagnosis
  - Clinical
  - Radiological: chest radiograph (if available)
  - Laboratory: cultures, bronchoscopy (if indicated and available)
- Treatment
  - Supportive care (eg, IV fluids, oxygen)
  - Consider TB skin test in all children
  - Duration: 5–10 days for uncomplicated infection, 2–4 weeks for complicated or severe infection
  - Antibiotics
    - < 2 months old: IV penicillin + gentamicin; **OR** penicillin + cefotaxime
    - > 2 months old: IV ceftriaxone or penicillin alone; PO TMP/SMX
    - If HIV is suspected or patient is severely malnourished, consider TMP/SMX
    - If nosocomial or immunosuppressed, consider vanco-

mycin, antifungals, or TMP/SMX
    - If aspiration is the etiology, provide anaerobic coverage (clindamycin or AMP/sulbactam)
- Complications
  - Suspect complications in cases of severe pneumonia with prolonged fever, septic appearance, slow response to antibiotics, and clinical deterioration
  - Abscess
    - Obtain a CT scan, if possible
    - Include anaerobic coverage
    - Extend treatment to 3–4 weeks or more
  - Effusion/empyema
    - Suspect in patients with dyspnea and pleuritic pain
    - Patients will exhibit dullness to percussion and decreased breath sounds
    - Take decubitus films, CT scan, and ultrasound, if available
    - Use a chest tube rather than thoracentesis to address large effusions, if possible

Whooping Cough/Pertussis

- Symptoms
  - Suspect if patient exhibits paroxysmal cough, facial petechiae, or posttussive emesis, or if patient's face turns red or blue with cough
    - Catarrhal: mild symptoms of upper respiratory infection (URI), antibiotics may ameliorate disease and limit spread; neonates may present with apnea
    - Paroxysmal: paroxysms of cough with inspiratory whoop, with or without posttussive emesis
    - Convalescent: symptoms wane gradually over weeks to months (usually afebrile); can last 6–10 weeks or longer
  - Most severe in children < 6 months old, who may present with apnea or elevated WBC count with lymphocytosis
- Epidemiology
  - *B pertussis, Bordetella parapertussis*
  - Humans are the only hosts
  - Transmitted via aerosolized droplets
  - Adolescents and adults are important infectious sources;

incidence is increased in conditions of close contact
- Diagnosis: clinical (culture or polymerase chain reaction, if available)
- Treatment
  - Macrolides (azithromycin, erythromycin, clarithromycin)
    - Alternatively, use TMP/SMX (in children > 2 mo old)
    - Do not use erythromycin in infants < 2 months old; it may cause pyloric stenosis
  - Supportive (eg, IV fluids, rest, oxygen)
  - Prophylaxis and control
    - Immunization
    - Postexposure prophylaxis (same dose and duration as treatment)
      - Erythromycin: 40–50 mg/kg/day, qid for 14 days (maximum 2 g/day; estolate salt is better tolerated)
      - Azithromycin: 10–12 mg/kg once daily for 5 days (**do not step down doses on days 2–5**; maximum of 600 mg/day)
      - Clarithromycin: 15–20 mg/kg/day, bid for 7 days (maximum 1 g/day)
      - TMP/SMX: if patient cannot tolerate erythromycin, give 8 mg/kg/day TMP component, bid for 14 days

Tuberculosis
- Symptoms: fever, weight loss/failure to thrive, cough, night sweats, chills
  - Extrapulmonary findings may include meningitis, lymphadenitis, and involvement of bones, joints, skin, and middle ear or mastoid
- Epidemiology
  - *M tuberculosis*
  - Increased in populations with high HIV rates
- Diagnosis
  - A positive TB skin test in children is defined as:
    - 5–9 mm induration, if the child:
      - Shows clinical or radiological evidence of TB
      - Has had close contact with an adult with active pulmonary TB

        - Is on immunosuppressive drugs or is immunosuppressed
      - 10–14 mm induration if the child:
        - Is < 4 years old
        - Has other serious medical conditions
        - Is born in a high-prevalence area
        - Has been exposed to adults with HIV
        - Is homeless
      - > 15 mm induration in a child ≥ 4 years old with no risk factors
    - Use chest radiograph to evaluate for evidence of active disease
- Treatment
  - Active disease
    - Pulmonary/extrapulmonary (except meningitis):
      - 2 months of isoniazid + rifampin + pyrazinamide **followed by**
      - 4 months of isoniazid and rifampin (see drug dosages below)
    - If resistance is a concern due to location, history, or presentation, add:
      - Ethambutol or streptomycin for the first 2 months until susceptibilities are available
      - Ethambutol can cause optic neuritis, so avoid use in young children unless they can cooperate with tests for visual acuity and color blindness
    - For meningitis:
      - 2 months of isoniazid, rifampin, pyrazinamide, and an aminoglycoside or ethambutol once a day, followed by 7–10 months of isoniazid and rifampin once a day or twice weekly for 9–12 months total
    - In active pulmonary disease, patient should get a follow-up chest radiograph after 2 months for response evaluation
    - Drug dosages:
      - Isoniazid: 10–15 mg/kg/day (maximum 300 mg/day) **OR** 20–30 mg/kg twice weekly
      - Rifampin: 10–15 mg/kg/day (maximum 600 mg/day) **OR** 10–20 mg/kg twice weekly

        - Pyrazinamide: 30–40 mg/kg/day (maximum 2 g/day) **OR** 50 mg/kg twice weekly
        - Ethambutol: 15–25 mg/kg/day (maximum 2.5 g/day) **OR** 50 mg/kg twice weekly
        - Streptomycin: 20–40 mg/kg/day (IM or IV), maximum of 1 g
  - Children with TB likely acquired it from an adult, so investigate all who have had contact with the infected child, looking for the index case as well as other infected children
    - Children and adolescents exposed to a contagious case of TB should have a TB skin test, physical examination, and chest radiograph
    - Children < 4 years old or whose immune systems are impaired should receive 9 months of isoniazid prophylaxis, regardless of TB skin test results
      - In immunocompetent patients with negative TB skin tests, continue isoniazid and recheck TB skin test in 12 weeks
      - If skin test is still negative, discontinue medication
  - Latent TB infection
    - 9 months of isoniazid once a day for 9 months, or 6 months of rifampin once a day if patient is isoniazid resistant
    - Routine laboratory checks are unnecessary; monitor transaminases in children with severe active disease or risk factors for hepatitis
    - Provide B_6 (pyridoxine) supplementation for adults or malnourished children to prevent isoniazid-induced neuritis

Diarrhea in a Humanitarian-Assistance Setting

- Symptoms
  - Three or more loose or watery stools per day
  - Acute diarrhea starts suddenly and is generally self-limited after several days
  - Persistent diarrhea starts like acute diarrhea but lasts 14 days or more
- Etiology
  - Major cause of morbidity and mortality among children worldwide

- The World Health Organization (WHO) recognizes acute watery diarrhea and dysentery as the two basic types of acute diarrhea
  - Acute watery diarrhea may be caused by rotavirus, cholera, *Campylobacter*, *Escherichia coli*, *Salmonella*, or *Yersinia*; when patient presents with a high volume of watery stools with flecks of mucous (rice water stools), rule out cholera
  - Dysentery is defined as bloody, mucoid diarrhea, and is usually caused by gram-negative bacteria (*Shigella, Salmonella* species, or *E coli*), *Entamoeba histolytica,* and rarely, *Clostridium difficile*
- Almost all these agents are transmitted by ingestion of contaminated food or water and by person-to-person spread; contact precautions are encouraged

- Diagnosis
  - Use clinical diagnosis and empiric treatment for most cases
  - Most cases in infants are of viral etiology (rotavirus)
  - Confirm initial cases of cholera and bacillary dysentery microbiologically, if possible
  - WHO case definitions for cholera:
    - Person ≥ 5 years old with severe dehydration or death due to watery diarrhea
    - Person ≥ 2 years old with watery diarrhea in an area with a cholera outbreak
- Treatment (derived from WHO guidelines; assumes limited resources and limited or no laboratory support)
  - Assess dehydration (ie, none, some, severe)
  - Prevent dehydration by increasing fluid intake (use oral rehydration solution [ORS] or breast milk)
  - Treat dehydration
  - Provide nutritional support and encourage feeding; support breast-feeding
  - Use antibiotics selectively
  - Avoid use of antimotility agents
  - Empiric treatment
    - No dehydration: increase fluid intake to more than usual amount
    - Some dehydration: give ORS until skin turgor normal-

izes and thirst abates; start with 75 mL/kg in first 4 hours
- Severe dehydration: use IV fluid therapy
  - Use a nasogastric tube if unable to place an IV within 30 minutes
  - Start ORS as soon as the patient can tolerate it
  - Give 30 mL/kg bolus, then another 70 mL/kg over next 4–6 hours
- Zinc supplementation for 10–14 days will mitigate current illness and decrease incidence of subsequent episodes (10 mg a day for children < 6 mo old, 20 mg a day for those > 6 mo old; check the available zinc salt preparation for zinc content)
- Treat with an antibiotic if dysentery is likely (know local resistance patterns if possible)
- WHO guidelines for empiric therapy:
  - Ciprofloxacin: 500 mg PO bid for 3 days (adults), 15 mg/kg PO bid for 3 days (off-label use for pediatric patients)
  - Azithromycin 10 mg/kg PO for 3 days is an alternative
  - Resistance rates to TMP/SMX and AMP make them poor empiric choices
- Antibiotics will shorten duration of cholera symptoms
  - In large outbreaks, reserve for severe cases
  - Administer one dose of doxycycline (300 mg PO; WHO guidelines recommend this as off-label use for all patients)
- For patients with persistent diarrhea in the absence of a confirmed parasitological diagnosis, provide two courses of antibiotics for dysentery; if symptoms persist, treat for giardia and amoeba
- Amebiasis
  - Symptoms
    - Abdominal pain
    - Fever
    - Diarrhea, usually bloody or mucoid
    - Right upper quadrant abdominal pain may represent amebic abscess
  - Etiology: *Entamoeba histolytica*
  - Diagnosis

- Identify trophozoites or cysts on stool sample
- Rapid antigen tests may be available

▹ Treatment
- Give metronidazole for dysentery and abscesses
- Administer diloxanide furoate, iodoquinol, or paromomycin to eradicate cysts from stool

► For endemic population, eradicating cysts from stools is not indicated. Chlorinating water will not kill *Entamoeba*; boil water for 1 minute

Systemic Conditions

Sepsis and Meningitis

- Symptoms
  - The clinical case definition of meningitis is sudden onset of fever (> 38°C axillary) and one of the following:
    - ► Neck stiffness
    - ► Altered consciousness
    - ► Other meningeal sign, such as:
      - ▹ Kernig sign: flex the patient's knees and the neck bends in response
      - ▹ Brudzinski sign: flex the patient's neck and the knees bend in response
    - ► Petechial or purpural rash
    - ► In patients < 1 year old, meningitis is suspected when fever is accompanied by a bulging fontanel
    - ► *Neisseria meningitidis* also causes meningococcal septicemia
      - ▹ Severe disease with signs of acute fever, purpura/petechiae, and shock
      - ▹ Though less common, the case fatality rate is high
- Etiology: *N meningitidis, S pneumoniae*, and *H influenzae* account for > 80% of all cases of bacterial meningitis and sepsis in unimmunized populations
- Diagnosis
  - Blood culture
  - Lumbar puncture should be done as soon as meningitis is suspected and before starting antimicrobial treatment
    - ► In bacterial meningitis, cerebrospinal fluid is usually

cloudy or purulent (but may be clear or bloody)
        - In malaria-endemic areas, thick and thin smears of blood should be made to differentiate meningitis from cerebral malaria
- Treatment
    - If bacterial meningitis is suspected, antibiotic treatment should be started immediately after a lumbar puncture without waiting for the results; treatment should not be delayed if lumbar puncture cannot be performed in a timely manner (Table 29-1)
    - Viral meningitis is rarely serious and requires supportive care, but a lumbar puncture is necessary to differentiate it from bacterial meningitis
    - During large epidemics among refugees or displaced populations, a single-dose regimen of oily chloramphenicol (100 mg/kg, maximum 3 g; IM) can be used if resources or circumstances do not permit a full course of standard treatment
        - Oral chloramphenicol also effectively penetrates the central nervous system
        - Single-dose ceftriaxone IM or IV (100 mg/kg, maximum 4 g) was equivalent to the single dose of oily chloramphenicol in one study
    - Chemoprophylaxis of local civilian contacts is often not recommended in emergency situations; however, exposed healthcare workers should receive prophylaxis if meningococcus is suspected or confirmed. Administer:
        - Rifampin: 20 mg/kg, maximum 1,200 mg, every 12 hours for 2 days
        - Ceftriaxone: single dose, 125 mg IM for those ≤ 14 years old, 250 mg for those ≥ 15 years old
        - Ciprofloxacin: single dose, 500 mg PO for those ≥ 18 years old

Acute Rheumatic Fever

- Symptoms: most commonly presents with arthritis or carditis
- Etiology: inflammatory process occurring after pharyngitis due to certain group A β-hemolytic streptococci types; however, fewer than two thirds of patients remember having a sore throat in the months before presenting

Table 29–1. Empiric Therapy for Bacterial Meningitis and Sepsis in Developing Countries

Patient Group	Likely Etiology	Treatment	Duration of Therapy
Immunocompetent children < 2 mo old	Group B streptococcus *Escherichia coli* *Listeria* *Salmonella* spp	Ampicillin 200–300 mg/kg/day ≤ 7days ÷ q8h; > 7 days ÷ q6h **PLUS** Gentamicin 2.5 mg/kg q12h **OR ADD** Cefotaxime 50 mg/kg q8h	3 wk
Immunocompetent children 2 mo–18 y old	*Haemophilus influenzae* *Streptococcus pneumoniae* *Neisseria meningitidis* *Salmonella* spp	Ceftriaxone 100 mg/kg q24h (if resistant *Streptococcus pneumoniae* is present,add vancomycin 40 mg/kg/day, divided q6–8h)	*Haemophilus influenzae*: 10 days *Streptococcus pneumoniae*: 10–14 days *Neisseria meningitidis*: 7 days *Salmonella* spp: 21 days
Neurosurgical problems and head trauma	*Staphylococcus aureus* *Staphylococcus epidermidis* Gram-negative organisms *Streptococcus pneumoniae*	Vancomycin and a third-generation cephalosporin	Minimum 3 wk

- No specific diagnostic test exists
- Common among children aged 6–15 years, rare in infants and preschool-aged children, may occur in adults

- Diagnosis
  - Evidence of recent streptococcal infection is required (positive throat culture or rapid streptococcal test), recent scarlet fever, or positive antibodies (antistreptolysin O or deoxyribonuclease B)
  - Must also have 2 major criteria **OR** 1 major and 2 minor criteria (chorea and recurrent acute rheumatic fever do not require minor criteria for diagnosis)
    - Major criteria
      - Carditis: congestive heart failure, pericarditis with rub, new murmur
      - Arthritis: migrates from one joint to another, usually large joints
      - Sydenham chorea ("St Vitus' Dance"): uncontrolled proximal limb movements, associated with emotional lability
      - Erythema marginatum: begins as macules on the trunk or proximal extremities, spreads outward to form a snakelike ring with clearing in the middle
      - Subcutaneous nodules: painless, firm, on the back of wrists, outside elbows, and front of knees
    - Minor criteria
      - Arthralgia
      - Fever
      - Elevated ESR, CRP, or leukocytosis
      - Prolonged PR interval on electrocardiogram (ECG)
- Treatment
  - Penicillin V 250 mg PO bid for 10 days
  - Aspirin (initially 80–100 mg/kg/day in four doses, decreased to 10–15 mg/kg/dose when afebrile) or naproxen (15–20 mg/kg/day in two doses)
  - Benzathine penicillin G 25,000 units/kg IM every 3–4 weeks (maximum of 1.2 million units/dose)

Urinary Tract Infections and Pyelonephritis

- Symptoms
  - Fever, irritability, foul-smelling or discolored urine, urinary

frequency and urgency, dysuria, emesis, diarrhea
  - Urinary tract infection (UTI) should be considered in any child < 2 years old with unexplained fever
- Etiology: Gram-negative enteric organisms, especially *E coli*
- Diagnosis
  - Culture
  - Specimens obtained by bag are useful for urinalysis, but not for culture because of skin contamination
  - If culture is not available, use urine dipstick or microscopy
    - Leukocyte esterase test on a urine dipstick is sensitive, but not specific
    - Nitrite is specific for UTI, but not sensitive
    - > 10 white blood cells per high-powered field on microscopy
    - Bacteria is also noted
- Treatment
  - Standard first-line therapies in the nontoxic child (7-day course):
    - Amoxicillin (40 mg/kg/day)
    - Amoxicillin-clavulanic acid (40 mg/kg/day)
    - Ciprofloxacin (20 mg/kg/day)
    - TMP/SMX (10 mg/kg/day of TMP)
  - Reevaluate in 1–2 days
  - If the child is toxic, IV or IM third-generation cephalosporin or an aminoglycoside are preferred
- Follow-up and prophylaxis
  - If possible, evaluate anatomy and the presence of reflux
  - If it is a recurrent infection, administer prophylactic antibiotics (consider amoxicillin or TMP/SMX at half the usual daily dose, given at bedtime)

Miscellaneous Tropical Diseases

Dengue and Dengue Hemorrhagic Fever

- Symptoms of dengue
  - Acute onset fever lasting 3–4 days
  - Intense headache
  - Retrobulbar eye pain
  - Myalgias
  - Arthralgias

- Anorexia
- Rash

- Symptoms of dengue hemorrhagic fever (high mortality rate)
  - All of the above

PLUS

  - Severe sepsis
  - Multiorgan system failure
  - Anemia
  - Thrombocytopenia
  - Disseminated intravascular coagulation (DIC)
  - Shock
- Diagnosis
  - Clinical suspicion
  - Positive tourniquet test
    - Inflate a blood pressure cuff on the upper arm to a point midway between the systolic and diastolic pressures for 5 minutes
    - A test is considered positive when 10 or more petechiae per 2.5 cm^2 (1 $in.^2$) are observed after the cuff pressure has been released for 2 minutes
    - The test may be negative or mildly positive during the phase of profound shock
    - It usually becomes positive, sometimes strongly positive, if the test is conducted after recovery from shock
    - Serology, if available
- Treatment
  - Give aggressive isotonic fluids
  - Give blood products only if there is severe bleeding

Diphtheria

- Symptoms range from a moderately sore throat to toxic, life-threatening diphtheria of the larynx or of the lower and upper respiratory tracts
  - Throat may be covered by a grey membrane and the patient may have a "bull neck" appearance from local edema of the neck
  - Nasal mucosa is generally markedly inflamed
  - Often complicated by myocarditis (rhythm disturbance due

to toxin) and neuritis (toxic damage to peripheral nerves)
    - Can be fatal; 5%–10% of diphtheria patients die, even if properly treated (untreated patients die in greater numbers)
    - Untreated patients are infectious for 2–3 weeks
- Etiology
    - *Corynebacterium diphtheriae*
    - In several developing countries (particularly Eastern Europe and Asia), diphtheria is the leading cause of pharyngitis in unimmunized children during an outbreak
- Diagnosis
    - Clinical and culture
    - Probable case definition according to WHO:
        - Recent (within 2 wk) contact with an individual confirmed contaminated
        - Diphtheria endemic to region
        - Stridor
        - Swelling/edema of the neck
        - Submucosal or skin petechiae
        - Toxic circulatory collapse
        - Acute renal insufficiency
        - Myocarditis and motor paralysis 1–6 weeks after onset
- Treatment
    - Equine diphtheria antitoxin (20,000–100,000 units); penicillin or macrolide
    - Obtain cultures before giving antibiotics
- Transmitted by spread of large droplets
    - Monitor contacts closely for development of disease
    - Provide prophylaxis via 600,000 units penicillin (IM) in those < 6 years old, 1.2 million units (IM) in those ≥ 6 years old

Human Immunodeficiency Virus and Acquired Immunodeficiency Syndrome

In deployment settings, there is no way to properly administer antiretroviral therapy. In underdeveloped countries, the rates of HIV may be very high, and the provider should always be suspicious that an ill or malnourished patient is infected.

- Symptoms
    - Often severe pneumonia in infancy (*Pneumocystic carinii*

pneumonia)
  - Generalized lymphadenopathy
  - Enlarged, nontender parotitis
  - Failure to thrive
  - Mucocutaneous candidiasis
  - Recurrent sepsis
- Diagnosis
  - Serology
  - Viral load
  - Clinical appearance
- Treatment is supportive; assume pneumonia is caused by TB or *P carinii* pneumonia until proven otherwise

Polio
- Symptoms
  - > 95% are asymptomatic
  - Others have nonspecific URI
  - A small percentage has aseptic meningitis
  - 0.1%–2% will develop flaccid paralysis
- Etiology: Poliovirus (enterovirus) types 1, 2, and 3; still endemic in parts of Africa and Asia, recent epidemics in Afghanistan
- Diagnosis
  - Viral culture of stool (best), urine, pharynx, or cerebrospinal fluid
  - Best if done within 14 days of onset of illness
  - Serology
- Treatment: supportive
- Prophylaxis and control
  - Vaccinate susceptible individuals
  - Identify all known cases and contacts for outbreak control

Japanese Encephalitis
- Symptoms
  - Headache
  - Fever
  - Meningeal signs
  - Stupor
  - Disorientation

    - Coma
    - Tremors
    - Paresis (generalized)
    - Hypertonia
    - Loss of coordination
        - Cannot be distinguished clinically from other central nervous system infections
        - Severe infections are marked by acute onset, headache, high fever, meningeal signs, and coma
- Etiology: acute, inflammatory, mosquito-borne disease involving the brain, spinal cord, and meninges
    - Common and usually asymptomatic
    - Case fatality rate among individuals with clinical disease is 25%–50%
    - Infants and the elderly are most susceptible to severe disease
    - Occurs in east, southeast, and southern Asia
    - Especially associated with rice-growing areas and pigs
- Diagnosis: demonstration of specific immunoglobulin M in acute-phase serum or cerebrospinal fluid
- Treatment: supportive
- Prophylaxis and control
    - Use protective clothing and repellents to avoid exposure to mosquitoes
    - Screen sleeping and living quarters
    - House pigs away from living quarters
    - Vaccines are available

Malaria

- Symptoms
    - *Plasmodium falciparum*
        - Anemia may be severe (hemoglobin < 5 gm/dL), particularly in nonimmune and pregnant patients
        - Hyperparasitemia (> 5% of red blood cells infected on smear)
        - Hyperthermia (body temperature > 41°C)
        - Hypoglycemia and acidosis
        - Cerebral malaria, marked by seizures or coma (more common in children, with mortality rate of 15%–30%)

        - Renal failure
        - Pulmonary edema
        - Diarrhea is a common presenting sign in children
    - *Plasmodium vivax*
        - Cyclic fevers and chills
        - Splenic rupture (late manifestation)
    - *Plasmodium malariae* and *Plasmodium ovale*
        - Few complications due to low-level parasitemia
        - *P malariae* has been associated with immune complex glomerulonephritis
- Diagnosis: The presence of fever in an endemic area; confirm using laboratory methods
    - Microscopy
        - Thick smears are sensitive for diagnosis
        - Thin smears are needed for determining what species is causing the infection
        - Multiple smears must be examined to rule out malaria
    - Rapid test is useful for *P falciparum* and *P vivax*
- Treatment
    - Treatment medications are the same as for adults, and are based on the infecting species, possible drug resistance, and severity of disease (use IV therapy only for severe disease)
    - IV therapy
        - Quinidine gluconate: 10 mg/kg loading dose (maximum 600 mg) by IV infusion over period of 1–2 hours. Give the first 2 mg/kg as a test dose with continuous ECG monitoring for idiosyncratic prolongation of QRS or arrhythmias. Watch for hypoglycemia and hypotension. Follow loading dose with continuous infusion of 0.02 mg/kg/min to keep levels at 3–7 mg/L until parasitemia is < 1% or patient is able to take oral medication
        - Artesunate: 2.4 mg/kg/dose IV at 0, 12, 24, and 48 hours
    - Oral therapy
        - *Plasmodium* with no resistance noted:
            - Chloroquine phosphate: 10 mg base/kg (PO; maximum 600 mg base) initially, then 5 mg base/kg (PO; maximum 300 mg base) at 24 and 48 hours
        - *Plasmodium* with known chloroquine resistance noted:

        - Quinine sulfate: 25 mg/kg/day (PO; maximum 2,000 mg), divided tid for 3–7 days

AND one of the following:

    - Tetracycline: 20 mg/kg/day (PO; maximum 750 mg) divided qid for 7 days for children > 8 years old,

OR

    - Clindamycin: 30 mg/kg/day PO divided tid for 5 days,

OR

    - Pyrimethamine/sulfadoxine: single dose on the last day of quinine therapy
        - < 1 year old: ¼ tablet
        - 1–3 years old: ½ tablet
        - 4–8 years old: 1 tablet
        - 9–14 years old: 2 tablets
        - > 14 years old: 3 tablets,

OR

    - Atovaquone/proguanil or mefloquine can also be used
  - If PO medications cannot be taken (eg, in the case of a newborn), begin with the IV dosage of quinidine gluconate as noted above
  - Consider exchange transfusion at ≥ 10% parasitemia
- Prophylaxis
  - Chloroquine-sensitive areas: chloroquine 5 mg/kg base, maximum 300 mg
  - Chloroquine-resistant areas:
    - Mefloquine
      - < 15 kg: 5 mg/kg/wk
      - 15–19 kg: ¼ tablet/wk
      - 20–30 kg: ½ tablet/wk
      - 31–45 kg: ¾ tablet/wk
      - 45 kg: 1 tablet/wk
    - Doxycycline for those > 8 years old: 2 mg/kg
    - Malarone:
      - 11–20 kg: 1 pediatric tablet/day
      - 21–30 kg: 2 pediatric tablets/day
      - 31–40 kg: 3 pediatric tablets/day
      - 40 kg: 1 adult tablet/day
  - Eliminate standing bodies of water that serve as mosquito

breeding sites (eg, old tires, mud puddles, etc)
- Use permethrin-treated bed nets

Measles

Measles (rubeola) has played a significant role in all situations involving displaced persons. It can lead to high mortality in unimmunized individuals, particularly those who are malnourished and very young

- Symptoms
  - Fever
  - Cough
  - Coryza
  - Conjunctivitis
  - Koplik spots
  - Cephalocaudal progressive rash
- Treatment
  - Recognition of the clinical disease spectrum, immunization, and treatment
  - Immunization should target malnourished children in displacement situations and those between 6 months and 5 years old, with an emphasis on the youngest children
  - Rubeola will often unmask vitamin A deficiency; prophylactic supplementation should occur as follows:
    - < 12 months old: 100,000 IU (PO)
    - > 12 months old: 200,000 IU (PO)
- Complications and associated findings
  - Cervical adenitis
  - Mesenteric: abdominal pain, appendicitis
  - Upper respiratory tract: otitis media, mastoiditis, oral ulcers
  - Lower respiratory tract: croup, bronchiolitis, pneumonia
  - Bacterial superinfection
  - Central nervous system: encephalitis
  - Malabsorption/malnutrition (significant cause of mortality)
  - Ocular: xerophthalmia/ulcerating keratomalacia in those who are vitamin A deficient
    - Individuals with these complications should receive a second dose of vitamin A on day 2
    - If ocular manifestations are present, a third dose should be given at 1–4 weeks

- Treat malnutrition and pyogenic complications with antibiotics

Humanitarian Issues

Children make up a large portion of the people involved in refugee and displacement situations. Common illnesses, such as diarrheal and respiratory illnesses, may proliferate. Limited numbers of trained medical personnel cannot care for hundreds or thousands of refugees on an individual basis. It is the goal in these settings for medical personnel to give hands-on training to volunteers from within the refugee population. Volunteers should be trained in vitamin A administration, preparation and delivery of WHO rehydration formulas, and the administration of vaccines to prevent disease within the camp. They should be given limited training in triage so they can determine who should actually receive care from the medical professionals. Medical professionals should limit their care to those most in need of trained providers. Some treatment recommendations may differ slightly in this chapter from other opinions in this text because in a refugee situation, resources are often extremely limited.

- Diarrheal disease
  - Much of the morbidity and mortality from diarrheal disease is due to dehydration
  - With these illnesses, poor hygiene and public health management may lead to outbreaks; consultation with preventive medicine specialists is important
  - For specific etiologies and treatment, see Diarrhea in a Humanitarian-Assistance Setting
- Respiratory tract infections
  - The majority of cases will be of a viral source and will **not** require antibiotic therapy
  - Antibiotics should be used for most complicated URIs and all suspected acute lower respiratory tract infections (many drugs have multiple doses depending on indication—please refer to Chapter 39, Pharmacotherapeutics, for specific guidance)
    - Complicated URIs are defined as otitis media or sinusitis with fever, or mastoiditis
      - Acute otitis media and sinusitis: give oral antibiotics

for 5–10 days
- Mastoiditis: give IV/IM antibiotics for 5–10 days

- Acute lower respiratory tract infections are defined by the presence of fever, cough, and tachypnea
  - Treat with antibiotics (TMP/SMX at 5 mg/kg/dose q12h for 5 days) respiratory rates are the following:
    - 0 months old: > 60 breaths/min
    - 2–12 months old: > 50 breaths/min
    - 1–5 years old: > 40 breaths/min
- **Danger signs**: nasal flaring, retractions, cyanosis, and persistent vomiting
  - Hospitalization is required
  - Give IV cefriaxone 100 mg/kg/day

Further Reading

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